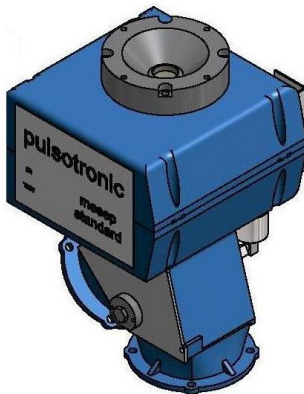
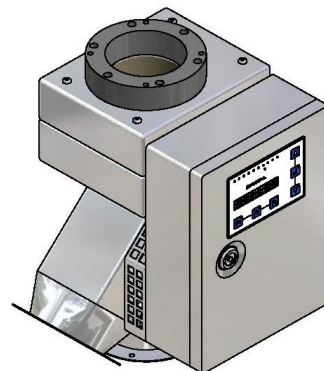


Operating Manual for METAL DETECTOR

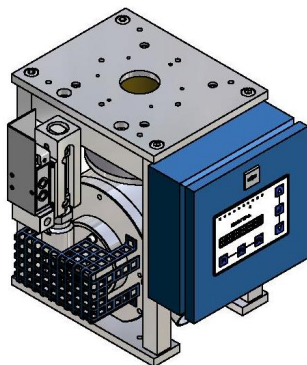
Models: SE, VA, Y and GF/GF Compact Free-Fall Detectors
with various controllers, including/excluding ejector
(The controller is described in a separate Operating Manual)



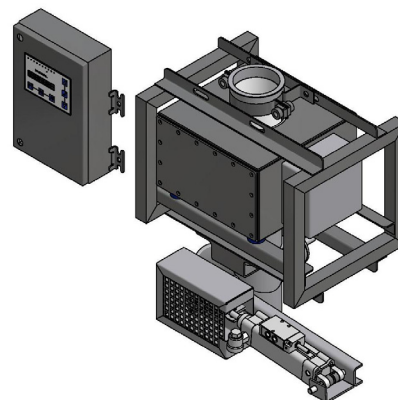
SE with standard electronics



VA with Digital+ electronics



Y with Digital+ electronics



GF with Digital+ electronics

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Chapter A

Introduction

Instructions for using the manual

This Operating Manual for the metal detector, in connection with the Operating Manual for the supplied controller, contains all the relevant information required to operate the Metal Detector described in the following, and is directed to the owner/operator and users carrying out the following tasks:

- Operation of the metal detector
- Initial commissioning
- Performing inspections and maintenance work at regular intervals
- Examining the safety equipment prior to commencing with work and while equipment is in operation
- Repairing faults

This User Manual was written in accordance with the German Equipment and Product Safety Act (GPSG) dated May 2004, the Machinery Directive and EN 292-1/2:1991+A1 1995D "Machinery Safety" (replaced by DIN EN ISO 12100-1/2:2004-04). It complements and expands on previously existing national Industrial Safety and Accident Prevention requirements, which must be observed during the operation of such machinery if used in an industrial setting.

Before commencing with work for the first time using the metal detector, this User Manual should be read and understood by all the persons who are authorized to work on and with the metal detector. Alternatively, these points in the Operating Manual for the Metal Detector can be dealt with by the owner/operator. Special stress should be placed on the Safety Information.

The User Manual is a component of the metal detector and must always be available for reference by the authorized circle of people. Chapters of this manual should never be removed from the manual at any time. Replace a missing manual or missing pages immediately if lost, especially the "Safety Information" chapter.

Messrs Pulsotronic do not grant an implied guarantee for the customary quality and suitability for a specific utilisation purpose.

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Structural changes by the owner/operator, which have implications on the technical data provided in this Operating Manual and the intended use, or which alter the machine considerably, will cause the Declaration of Conformity and the Manufacturer's Declaration to become null and void. This also applies to the CE Conformity Certificate, if the modifications affect the EMC characteristics.

Modifications in terms of technical progress are reserved. This Operating Manual is not subject to the updating services.

General Safety Information

Observance of the Safety Information and compliance with the safety measures are intended for personal safety, the safety of the work force and the technical safety of the equipment itself.

Potential electrical, mechanical and other dangers can emanate from the tunnel detector or surface detector with conveyor belt products.

Because of its functions, higher electromagnetic field strengths prevail within the detector tunnel; these drop to the ambient levels outside the tunnel, and thereby do not represent any threat.

- All staff must be briefed on working on the machine and must understand and comprehend the Operating Manual and User Guide.
- Equipment must only be used for the intended purpose. Warning about misuse.
- Observe the warning signs on the machine.
- Suitable protective clothes or personal protective equipment must be worn.
- The system must be switched off or not switched on at all if damages or faults are visible on the exterior.
- Work on the electrical and electronic equipment may only be carried out by authorized professional staff.
- The machine connection to the following required media (power, compressed air, ...) must be based on the technical requirements that are in effect.
- The machine must be switched off if any work inside the tunnel has to be performed (cleaning, rectifying conveyor malfunctions, etc.) because of the increased electromagnetic intensity inside the tunnel. Any personnel having a medical implant must be fully informed about the function of the system. Prior medical examination / consultation are required before they can work on the machine.
- Comply with the Accident Prevention regulation BGV B11 from 2001 regarding "Electromagnetic Fields".
- Observe the Safety Regulations concerning the use and handling of cleaning and disinfection materials.
- Observe the Safety Regulations concerning the use and handling of cleaning equipment (e.g. pressure washers).
- Observe the cleaning regulations and hygiene requirements.
- Warning: sharp edges and corners.
- Warning: Danger of shearing and crushing between belt and stand.
- Warning about hot and cold conveyed material.
- System may **never** be used in explosive surroundings.
- Never use explosive examination materials.
- Comply with the valid fire prevention regulations.
- Use CO₂ fire extinguishers or powder extinguishers.
- Warning: Belt conveyor may be electrostatically charged.
- Keep setup location or operator workstation clean. Warning: Danger of slipping or stumbling.
- Do not use on humans or live animals.
- Keep operating manual and instructions of use accessible at the device.
- Carry out occupational safety training at regular intervals.
- Do not reach into rotating or moving parts.

Chapter A

- Comply with the special rules for transportation, installation, commissioning, cleaning, maintenance and repairs as well as for disposing of the system itself.

Storage

- The storage location must be free of direct weather influences (frost, wetness, direct sunlight).
- Select a storage location in dust-free, enclosed spaces.
- The storage location must be free of condensation, acids, bases or other aggressive substances (vapors from these substances).
- Store system in a packaged state.
- If the packaged machine is being stored, open the wooden crate and examine the condition of the foil covering. In the event the foil cover is damaged, check the preservation of the entire contents.
- The surface on which the crate is set down must be level; the crate may only be set down on a firm, vibration-free base.
- The crate must stand vertically; do not store several crates on top of each other.
- Check to ensure the storage conditions are checked at regular intervals.

In the event of non-observance of the aforementioned conditions, the warranty entitlement for any ensuing technical faults becomes null and void as a result of inappropriate storage.

Transportation

The following safety instructions must be observed in order to avoid accidents, staff injuries and machinery damages:

- Any instructions and symbols attached to the packaging must be observed.
- During loading, always use hoists and load suspension devices with sufficient carrying power (observe mass/weight indications).
- Only padded cables or load belts may be used as load suspension materials. Chains could result in damages.
- All hoist equipment must be arranged and used in accordance with the regulations that are in effect (observe mass/load indications).
- Caution, suspended loads can fall down. Never stand underneath a suspended load!
- Only use suitable transportation vehicles with sufficient carrying power.
- Attach hoists and load suspension equipment only in the indicated places.
- The route of transportation must always be secured by a third party.
- Never transport loose pieces on top of each other – danger of load slipping.
- Never lift a complete system with a conveyor by the metal detector. The mass/load of the total system can result in damages to the metal detector or its destruction.
- When transporting, ensure that no connection lines are crushed/pinched.
- Never transport unit unless it is in a de-energized/idle state. Live cable ends or subassemblies can result in injuries due to electrical current.
- Always run connection cables in such a way that they do not cause stumbling or have sharp kinks (observe bending radius).

Technical Description

Purpose of Application

The SE, VA, Y and GF/GF Compact metal separators are exclusively designed to detect metallic foreign bodies in pourable non-metallic products, and to remove them from the product flow by means of a separating unit (flap or separating drum). For the GF/GF Compact units, the ejector unit must be ordered separately.

The devices are installed in places where metal contaminants are to be separated in the freely falling bulk or piles (only Y) of materials.

Uses for a different purpose or for a purpose which exceeds this description are considered incompatible with the intended or designated use. The manufacturer/supplier is not responsible for damages resulting from such uses. The User bears the sole risk.

Correct use also includes observing the Operating Manual and adhering to the inspection and maintenance conditions.

The safety equipment on the metal detectors and the accompanying peripheral devices must not be modified or removed. This is considered improper use and is prohibited.

SE, VA, Y and GF/GF Compact Metal Separators

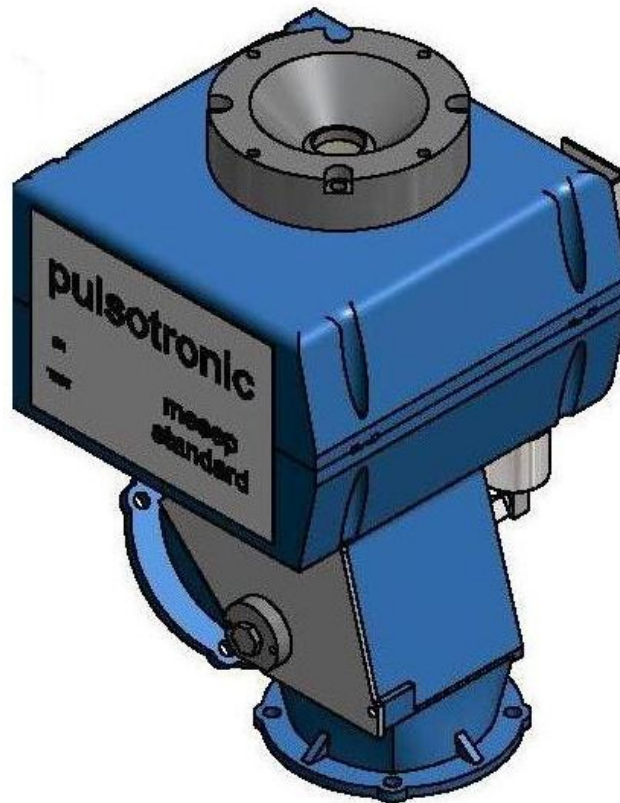
The SE Metal Separator

The SE Metal Separator largely consists of the following subassemblies:

- a ring sensor as a measuring probe
- the control unit for operation, control and signal processing
- a separating unit for removing product containing metal

The product that is being examined is fed into the metal separator from above. The drop height here should not be any larger than 600 mm. From there it travels via a product pipe through the ring sensor into the separator (flap). If the product does not contain any metal, it vertically exits (drops downwards) out of the metal separator. With the SE, it only makes very slight contact with the metal separator. As a result, the degree of wear on the flap and the housing parts is minimal. If the product does contain metal, the flap is switched by means of compressed air. In this way the metal-containing product travels into a collector container via the outlet spout on the side. Metal detection occurs through the interaction of the ring sensor and the control unit. The controller also addresses the flap. It is possible to optimize the yields of the products containing metal by using the three following parameters: product speed, ejection delay and ejection of the flap. The optimization criteria here are the safe removal of the metal and minimizing product losses. A description of the parameters are changed is contained in a separate Operating Manual for the respective control unit.

Chapter B



In the SE metal separator, the sensor housing is made of cast aluminium and the flap housing is made of cast stainless steel. This guarantees the device has an especially stable mechanical construction.

Metal separators with connection monitoring are equipped with an additional solenoid and a reset spring on the pneumatic cylinder of the separating flap. This guarantees that in the event of a disaster (power and/or compressed air failure), the separating flap always remains in the Reject position. Thus, no product containing metal can end up in the following machines.

As a further option, a wear-resistant SE model is also available. This is especially suitable for abrasive products. In that model, a glass tube is used as the product tube. The flap and other parts of the separator unit have a wear-resistant aluminium titanium dioxide coating. This considerably improves the service life of these wearing parts.

The VA Metal Separator

The VA Metal Separator largely consists of the following subassemblies:

- a ring sensor as a measuring probe
- the control unit for operation, control and signal processing
- a separating unit for removing product containing metal



The product that is being examined is fed into the metal separator from above. The drop height here should not be any larger than 600 mm. From there it travels via a product pipe through the ring sensor into the separator (flap). If the product does not contain any metal, it vertically exits (drops downwards) out of the metal separator. With the VA, there is no contact with the metal separator, as the flap is positioned vertically. As a result, the degree of wear on the flap and the housing parts is minimal. If the product does contain metal, the flap is switched by means of compressed air. In this way the metal-containing product travels into a collector container via the outlet spout on the side.

Metal detection occurs through the interaction of the ring sensor and the control unit. The controller also addresses the flap. It is possible to optimize the yields of the products containing metal by using the three following parameters: product speed, ejection delay and ejection of the flap. The optimization criteria here are the safe removal of the metal and minimizing product losses.

Chapter B

A description of the parameters that are changed is contained in a separate Operating Manual for the respective control unit.

With the VA metal separator, the sensor housing consists either of stainless steel sheeting or aluminium parts; this depends on the control unit that is being used. The Board consists of stainless steel sheeting.

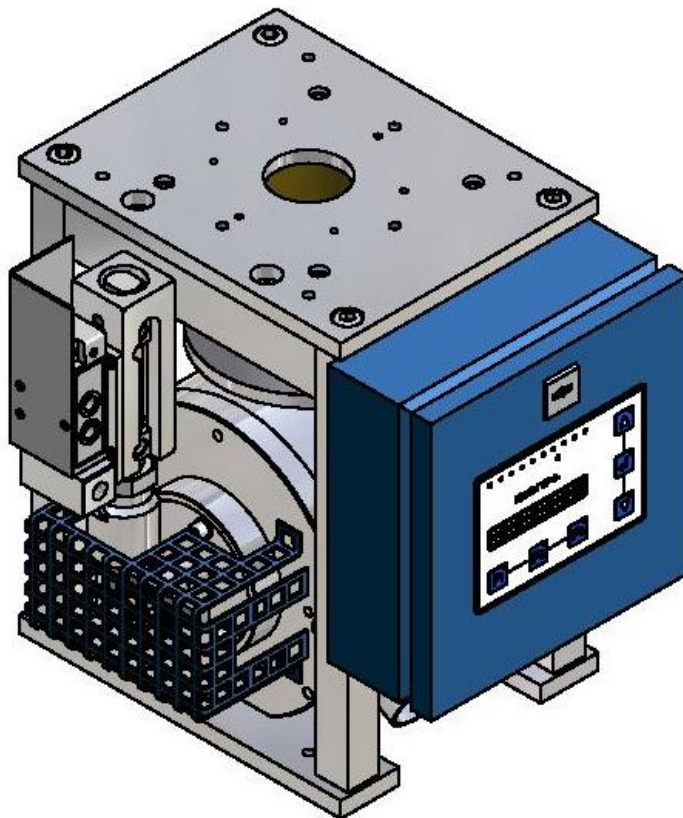
Metal separators with connection monitoring are equipped with an additional solenoid and a reset spring on the pneumatic cylinder of the separating flap. This guarantees that in the event of a disaster (power and/or compressed air failure), the separating flap always remains in the Reject position. Thus, no product containing metal can end up in the following machines.

As a further option, a wear-resistant VA model is also available. This is especially suitable for abrasive products. In that model, a glass tube is used as the product tube. Some of the parts of the separator unit have a wear-resistant aluminium titanium dioxide coating. This considerably improves the service life of these wearing parts.

The Y-type Metal Separator

The Y Metal Separator largely consists of the following subassemblies:

- a ring sensor as a measuring probe
- the control unit for operation, control and signal processing
- a separating unit for removing product containing metal



The product that is being examined is fed into the metal separator from above. The drop height here should not be any larger than 600 mm. From there it travels via a product pipe through the ring sensor into the separator (separating drum). If the product does not contain any metal, it vertically exits (drops downwards) out of the metal separator. With the Y, no contact is made with the metal separator. As a result, the degree of wear on the flap and the housing parts is minimal. If the product does contain metal, the separating drum is rotated by means of compressed air. In this way the metal-containing product is diverted and travels into a collector container via the outlet spout on the side. In contrast to the SE and VA metal separators, piles of product can also be processed here.

Metal detection occurs through the interaction of the ring sensor and the control unit. The controller also addresses the separating drum. It is possible to optimize the yields of the products containing metal by using the three following parameters: product speed, ejection delay and ejection from the separating drum. The optimization criteria here are the safe removal of the metal and minimizing product losses. A description of the parameters are changed is contained in a separate Operating Manual for the respective control unit.

In the type Y metal separator, the sensor housing and the separating drum are all aluminum parts.

Metal separators with connection monitoring are equipped with an additional solenoid and a reset spring on the pneumatic cylinder of the separating drum. This guarantees that in the event of a disaster (power and/or compressed air failure), the separating drum always remains in the Reject position. Thus, no product containing metal can end up in the following machines.

As a further option, a wear-resistant Y model is also available. It is especially suitable for abrasive products. In that model, a glass tube is used as the product tube. ,

The GF Metal Detector

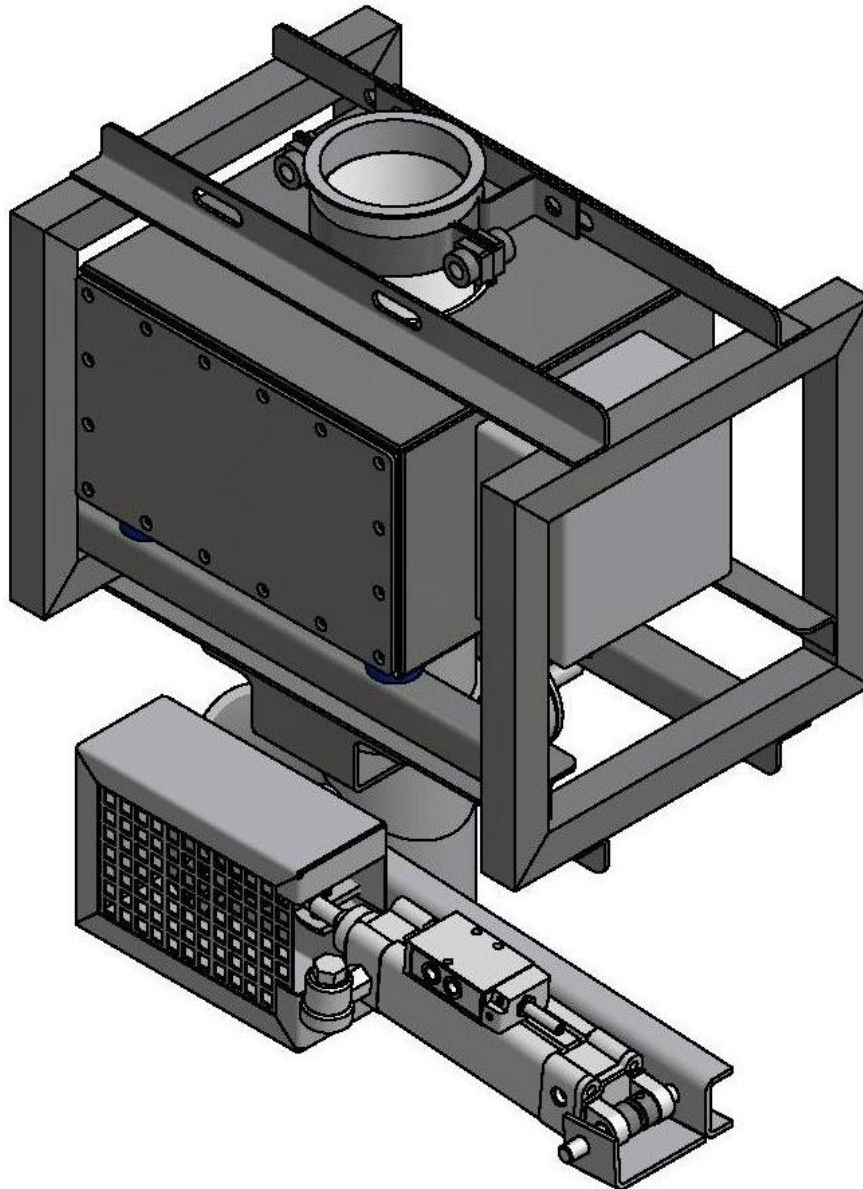
The GF Metal Separator largely consists of the following four subassemblies:

- a ring sensor as a measuring probe
- the control unit for operation, control and signal processing
- an installation rack for fastening all the subassemblies
- the optional use of an existing separating unit for removing product containing metal

The product that is being tested is fed from above in the metal detector. The drop height here should not be any larger than 600 mm. From there it travels via a product pipe through the ring sensor into the separator (flap). If the product does not contain any metal, it vertically exits (drops downwards) out of the metal detector. With the GF model, no contact is made with the metal detector. As a result, the degree of wear on the flap and the housing parts is minimal. If the product does contain metal, the flap is switched by means of compressed air. In this way the metal-containing product travels into a collector container via the outlet spout on the side.

Metal detection occurs through the interaction of the ring sensor and the control unit. The controller also addresses the flap. It is possible to optimize the yields of the products containing metal by using the three following parameters: product speed, ejection delay and ejection of the flap. The optimization criteria here are the safe removal of the metal and minimizing product losses. A description of the parameters are changed is contained in a separate Operating Manual for the respective control unit.

Chapter B



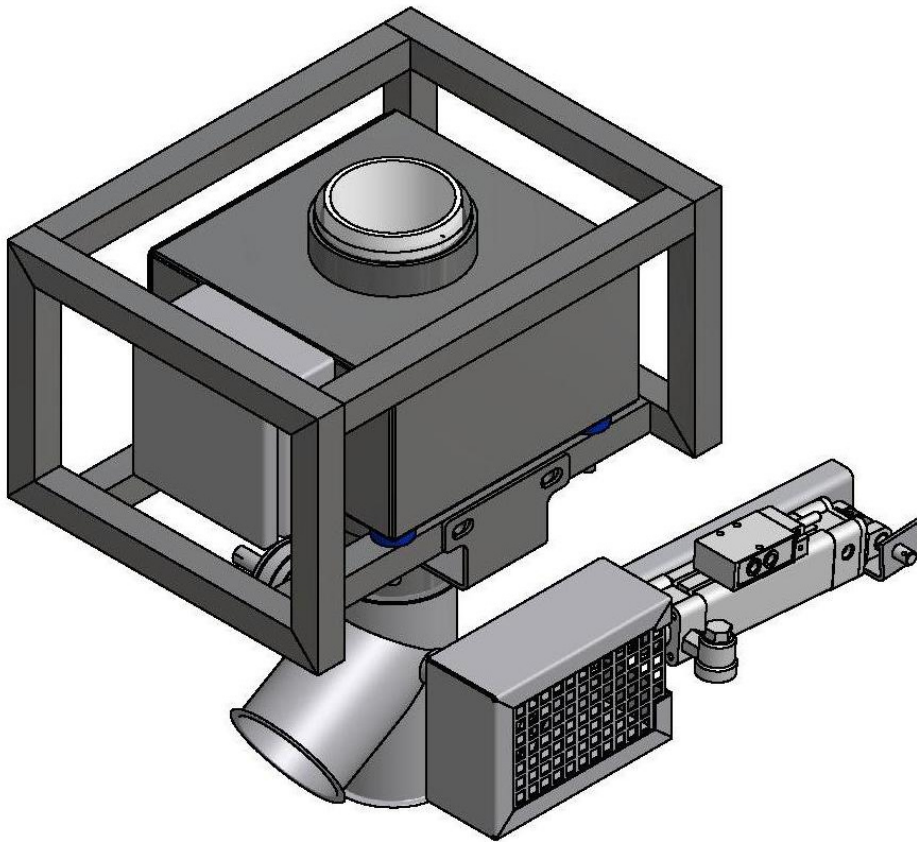
In the GF, the sensor housing, the entire separating unit and the installation rack are all stainless steel. This guarantees the device has an especially stable mechanical construction. As a further option, a wear-resistant GF model is also available. This is especially suitable for abrasive products. In that model, a glass tube is used as the product tube. The EX-K separating filter can be used as the separator unit, instead of the EX-S. With this separating filter, the flap can be replaced, in the event that it is worn. In addition, this separating filter also has a viewing window at the Good and Reject outlets, so the flap's condition of wear can be evaluated from the outside.

As a further option, these viewing windows are also available as cleaning openings. Thus, it is possible to open the separator quickly, e.g. for cleaning purposes.

The GF Compact Metal Detector

The GF Compact Metal Detector largely consists of the following four subassemblies:

- a ring sensor as a measuring probe
- an installation rack for fastening all the subassemblies
- the control unit for operation, control and signal processing
- the optional use of an existing separating unit for removing product containing metal



The product that is being tested is fed from above in the metal detector. The drop height here should not be any larger than 600 mm. From there it travels via a product pipe through the ring sensor into the separator (flap). If the product does not contain any metal, it vertically exits (drops downwards) out of the metal detector. With the Digital+ GF Compact model, no contact is made with the metal detector. As a result, the degree of wear on the flap and the housing parts is minimal. If the product does contain metal, the flap is switched by means of compressed air. In this way the metal-containing product travels into a collector container via the outlet spout on the side.

Metal detection occurs through the interaction of the ring sensor and the control unit. The controller also addresses the flap. It is possible to optimize the yields of the products containing metal by using the three following parameters: product speed, ejection delay and ejection of the flap. The optimization criteria here are the safe removal of the metal and minimizing product losses. A description of the parameters are changed is contained in a separate Operating Manual for the respective control unit.

Chapter B

In the GF Compact, the sensor housing, the entire separating unit and the installation rack are all stainless steel. This guarantees the device has an especially stable mechanical construction.

The difference between the GF Company and the GF is that the installation height is smaller. Thus, this device is suitable in cases where the installation space is at a premium. The disadvantage over the standard unit consists of the fact that the metal sensitivity is lower due to the more compact design.

As a further option, a wear-resistant GF model is also available. This is especially suitable for abrasive products. In that model, a glass tube is used as the product tube. The EX-K separating filter can be used as the separator unit, instead of the EX-S. With this separating filter, the flap can be replaced, in the event that it is worn. In addition, this separating filter also has a viewing window at the Good and Reject outlets, so the flap's condition of wear can be evaluated from the outside.

As a further option, these viewing windows are also available as cleaning openings. Thus, it is possible to open the separator quickly, e.g. for cleaning purposes.

The control unit

The SE, VA, Y and Gf/GF Compact metal detectors can be supplied with various types of control units. The control units differ with regard to the number of available product memory areas, the networking ability and the extent of the possible specific settings. The supplied control unit is described in a separate Operating Manual.

The control units are available in two types. The standard model is fastened directly onto the side of the sensor. A possible modification is the model which is set up some distance away, where a separate wall assembly is required. Here, the unit is supplied with a connection cable with a maximum length of 3 meters. Acoustic or visual signalling devices (e.g. beepers, flashing beacons) can be supplied as accessories.

Fundamental method of functioning

The SE, VA, Y and GF/GF Compact metal detectors use an inductive measuring principle, which is briefly explained below.

There are two coils in the sensor housing:

- the transmitter coil and
- the receiver coil

The coils must initially be balanced out before measuring commences. This step occurs automatically after activation and is called "lining-up".

Electric current conduction is produced in the transmitter coil by a generator. This produces an electromagnetic alternating field (magnetic field) in the sensor.

If a metal particle moves through the metal detector, and therefore through the magnetic field, the transmitter coil's magnetic field changes. As a result of changing the magnetic field, an electric current is produced in the receiver coil. This process is called electromagnetic induction.

The magnitude of the generated (induced) current has a direct relationship on the size and the magnetic and electric properties of the metal particles:

- large metal particles induce higher current than small metal particles
- magnetic metals (e.g. iron) induce a larger current than non-magnetic metals (e.g. copper)

The current induced in this way is measured and is processed and evaluated by the electronics. As this measuring principle responds to

- electrical conductivity and
- magnetism

it is possible to detect all types of metal. However, magnetic metals are easier to detect than non-magnetic ones. This measuring principle also makes it possible to detect metal particles within the interior of product or inside non-metallic packaging.

The examined products are not affected or changed in any way by this kind of measuring.

Utilization limitations with metal detectors

Not only metals, but many products, materials and raw materials are electroconductive to a greater or lesser amount. The cause of this is in the properties and the composition of the substances. Ingredients and properties such as:

- Salts
- Sugar
- Minerals
- Moisture
- Carbons

in the products have the effect that a current is constantly induced in the receiver coil, although there are no metal particles in the examined material. This process is called the "product or material effect". When using metal detectors, this effect expresses itself in such a way that the product constantly produces metal alarms even without metal. The product effect takes on a characteristic value for every material. As this value is constant within a certain bandwidth, this can be taken into account and counter-balanced by the metal detector. The metal detector is able to "learn" and save the various product characteristics, so that no more false alarms occur.

In practice, the achievable sensitivity is frequently dependent on the following characteristics:

- How well a potentially existing product effect can be counter-balanced by the metal detector
- How carefully the metal detector was installed (e.g. metallic contaminants in the conveyor's belt, moving metal directly beside the sensor, etc.)

Technical Data

The technical data is dependent on the respective control unit that is utilized. Thus, it is indicated in the Operating Manual for the respectively utilized control unit.

Chapter C

Assembly Instructions

Metal-free zone

No metal-free zones must be maintained outside the devices when using SE, VA and Y metal separators. The required metal-free zones have already been taken into consideration internally in the configuration of the devices.

When using the GF/GF Compact devices, this is different. Make sure the metal-free zones are maintained. In the GF type, no metal parts (e.g. connection pipes) are allowed to extend into the interior of the supplied installation rack. The rack delimits the metal-free zone. In the GF Compact types, it is necessary to maintain a distance of 1.5 times the sensor diameter above and below the sensor as a metal-free zone.

Installation information

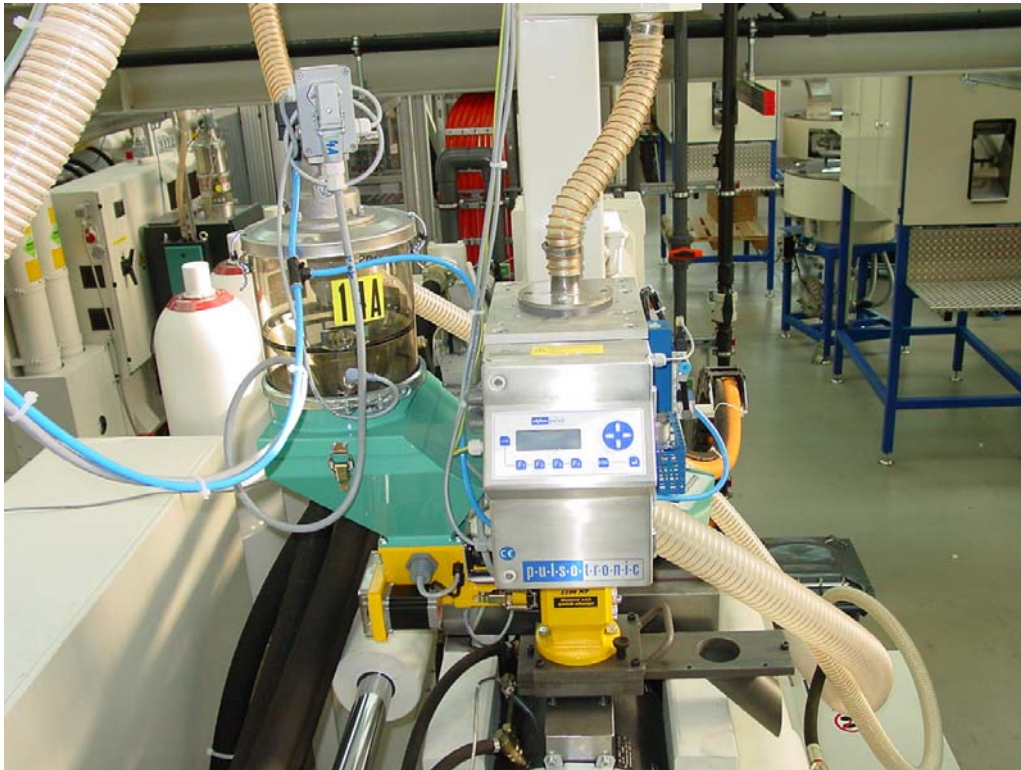
- All materials, which serve as packaging protection, must be removed carefully.
- The metal detectors must be mounted vertically in order that the metal detector wear is as low as possible as a result of any contact with the product. An angled installation position is not permitted.
- Fastening must be performed in such a way that none of the screws or other fastening materials can become loose unintentionally.
- During welding, please ensure that welding current is not allowed to flow through the housing of the metal detector under any circumstances. This causes the metal separator to be permanently damaged.
- Avoid mechanical twisting while installing the metal separator.
- Mount the funnel or corresponding muff onto the device opening.
- Mount the muffs onto the device outlets (for Good or Reject material) or facilitate a continuous flow of material in some other manner.
- When using funnels or muffs, the metal separator can be supplied or emptied using pipework.
- Funnels or muffs do not belong to the device's delivery school (order as an option).
- The maximum drop height of the product from the upper edge of the device (excluding the funnel) must not be more than a maximum of 600 mm.
- Strong tensile forces and reverberations at the intake and outlet stubs or strong reverberations due to system parts situated nearby, which could transfer to the device, will result in malfunctions as of a certain intensity. Therefore, uncouple the device from these influences and keep vibrations and reverberations as low as possible.

- Make sure the installation is mechanically stable and relieve the device of any tensile forces, by mechanically stabilizing the incoming and outgoing cables. The remainder of the system should not be connected to the metal separator!
- The metal separator may not be used in vacuum or pressure pipes.
- The metal separator must not be subjected to large temperature fluctuations during operation.
- Electrostatically charged product can result in false alarms in the metal separator. All the conveying lines or devices, which supply the metal separator with material, must absolutely be electrically grounded.
- When setting up the metal separator, ensure that there are no other devices in the vicinity which emit electrical interference fields (e.g. motors, frequency converters or other metal detectors). They can, under certain circumstances, lead to a malfunction of the metal separator.

With the SE, VA and GF/GF Compact metal separators, no material blockage must occur because the function of the metal separator can no longer be guaranteed in such a case.

Chapter C

Application examples



Utilising a M-Pulse Y on an injection moulding machine



Utilising a Digital Y on an injection moulding machine

Chapter C



Utilising an M-Pulse CA to inspect peanuts and pistachios

Commissioning

Setting up the Device

- All materials, which serve as packaging protection, must be removed carefully.
- When setting up the unit, it must be ensured that sufficient free space remains in front of and behind the metal detector so that commissioning and operating personnel have trouble-free access to the components.
- A waiting period must be ensured to allow the machine to adapt to the ambient temperature.
- Please carefully observe the installation instructions contained in Chapter C Assembly Instruction when installing the metal separator.
- The metal detector must not be subjected to any vibrations and temperature fluctuations during operation.
- When setting up the metal detector, it must be ensured that there are no other devices in the vicinity which emit electrical interference fields (e.g. motors, frequency converters or other metal detectors). They can, under certain circumstances, lead to a malfunction of the metal detector.

Connecting the Media

- The machine must be operated using the specified power supply (see Technical Data). All electrical wiring must be connected in accordance with DIN VDE 0100.
- All electrical connections may only be carried out by authorized electrical personnel.
- The electrical power supply cable must be laid in its own insulation duct, separate from other "noisy" power cables.
- The level and frequency of the supply voltage must be tested in accordance with the Technical Data.
- The pneumatic connection should have a pressure of 4..6 bar.

General

- The machine may only be commissioned by trained personnel.
- All electrical connection must be checked before starting up. Check to ensure the safety regulations are observed. In addition it is necessary to ensure that all electrical wiring and operational equipment are undamaged.
- Reports of metal must always be taken seriously. The source of the metal impurity must be sought.

Chapter D

Maximum achievable sensitivity

The maximum achievable sensitivity depends on various factors:

- The size of the probe coil (the larger the diameter of the probe coil, the smaller the achievable sensitivity).
- The secure assembly of the detector must be guaranteed (no loose connections). The smallest mechanical changes can generate enormous false signals. No distortion may occur due to mechanical stresses.
- No moving metal parts (e.g. shafts and deflection pulleys) may be mounted near the pickup coil.
- Ambient influences such as fields of electric interference (caused by other motors or frequency converter) as well as mechanical vibrations have negative effects on the attainable sensitivity.
- The products that are to be examined can have conductive properties themselves. This results in the fact that the product is detected as metal. This property is called a product effect. The magnitude of the product effect and the product volume that is to be examined also has a decisive influence on the attainable sensitivity.

Steps during commissioning

Activating the metal detector

- The metal detector is switched on by switching on the main switch. After activation, sensor calibration occurs automatically. During sensor calibration, the LED strip on the control panel is illuminated in red. Following sensor calibration, the metal detector is ready to operate and the LED display is illuminated in green. Once the compressed air is connected, a metal test specimen can be used to check the device functions properly.

Checking the ambient influences

- The metal detector is operated without running any product, but with the ejection, feed, filling or handling equipment; watch the bar graph on the display. If the indicator remains in the upper half of the bar graph, the metal detector has been installed properly and the ambient influence is low. For further processes, see heading *Testing product for product effects*.
- If the indicator goes into the second half, or metal alarms are triggered without product, it is necessary to check that the metal detector was installed correctly (loose connections, moving parts in the metal-free zone, strong vibrations, affected by magnetic or electric fields, possible earth circuit, etc).
- If the problem cannot be rectified by this, the metal detector can be calibrated to the elevated ambient influences by altering the sensitivity or activating the vibration filter (effect: deterioration of sensitivity, see separate Operating Manual for controller). See separate Operating Manual for controller for precise steps for Learning.
- The phase required for the vibration filter was already 'learned' and saved at the factory. It may be necessary to re-teach the vibration filter the production conditions (See separate Operating Manual for controller).

Checking the product for product effects

- Operate metal detector with product running through and once again watch the bar graph on the display.
- Strong product effect – the reading is clearly elevated, and alarms are triggered for metal-free product. See heading *Strong product effect* for further steps.
- Slight product effect – the reading remains almost constant or is only slightly elevated. See heading *Slight product effect* for further steps.

Strong product effect

- “Learning” the product effect is necessary. Only metal-free product is used for learning the product effect. To achieve optimum learning results, the passage of the product must be such that all the position and volume fluctuations, which can appear in subsequent operation, are also taken into account. See separate Operating Manual for controller for precise steps for Learning. Another product pass is carried out to check the metal detector after the learning process is completed. No more alarm triggering should occur for metal-free product. If sporadic alarms are still triggered, then this can be due to product fluctuations. The learning process should then be repeated once again to register these product fluctuations.
- The safe functioning of the metal detector is subsequently tested with test specimens or product.

Slight product effect

- This does not need to be ‘learned’. Operation is also possible just by altering the Sensitivity parameter. The required test specimens are passed through the metal detector along with product for this purpose. The sensitivity value continues to be reduced until the test specimen is no longer safely detected. Based on the ascertained threshold value, set a value that is 5-10% higher (for information on adjusting the sensitivity, see Operating Manual for controller). Next, all the test specimens are checked again to ensure all the test specimens are safely detected. This ensures that there are sufficient reserves for product fluctuations while optimum test specimen detection is available at the same time.

Commissioning by Service engineer

- Commissioning includes the briefing of one of the customer’s qualified staff members by the Service engineer.
- That staff member must be made available to the Service Technician on the day.
- To ensure commissioning is performed without any trouble, the installation of the device in the line should have been completed.
- The Service engineer has the task of checking the metal detector was installed properly. If faults are revealed during commissioning, the customer must ensure that the recommendations and suggested improvements made by the Service engineer are implemented immediately.
- Commissioning can only occur while production is underway. That way, a) all the ambient production conditions and b) the actual product characteristics can be registered and taken into consideration.

Chapter D

Commissioning

- Commissioning does not include the 'teaching' of all the various types of products. That is the task of the customer's staff member; he/she will easily be able to do this on his/her own following the training provided by our engineer.
- Commissioning cannot be completed successfully if production is not running or if the framework conditions will not allow it or if the customer's staff member is not available. In such a case, please cancel the appointment early enough in writing (at least 2 days before the service appointment).
- Attaining a reliable operating state without any false metal alarms is in the foreground during commissioning. The matter of achieving the best possible level of sensitivity only has a secondary importance. The maximum attainable sensitivity levels depend on various external factors and on the product itself; the Service engineer has no influence on these. Commissioning is considered completed once the metal detector has been set to the maximum achievable sensitivity for a specific product.
- The Service engineer cannot guarantee that 'relearning' of individual products will not be required if changes are made to the production parameters or the product characteristics. This does not automatically mean re-calibration (re-learning) will be done free of charge by our Service engineer.

Take advantage of the Technical Advice we offer, to recognise and rectify potential faults early on. Delayed rectification may cost a lot of time and money.

Control Unit

The SE, VA, Y and GF/GF Compact metal separators can be supplied with various types of control units. A detailed description of the respective supplied control unit is contained in a separate Operating Manual.

Cleaning and Maintenance

Cleaning

Because the product flows freely through the metal separator, it is normally not necessary to carry out cleaning at regular intervals. If a thorough cleaning should still become necessary, follow the procedure below:

- Stop feed
- Switch off metal separator and disconnect compressed air. Observe all the safety instructions
- Steps for SE and VE metal separators:
 - ⇒ Remove metal separator. Clean product tube, ring detector and separator with compressed air
 - ⇒ Re-install metal separator
- Steps for Digital+ Y:
 - ⇒ Remove separating drum. Undo the three hexagon socket screws and pull out the cover plate horizontally
 - ⇒ Clean product tube, ring detector and separating drum with compressed air
 - ⇒ Re-install separating drum. During installation, please ensure that the separating drum is aligned in such a way that it can engage with the shaft guide in the interior of the housing
- Steps for GF/GF Compact metal separator:
 - ⇒ Remove feed and discharge tubes. Clean product tube, sensor and separator with compressed air
 - ⇒ Re-install feed and discharge tubes
- Switch on compressed air and re-start the metal detector
- Enable conveyor

Regular inspections

In order to ensure safe operation it is very important that the function of the detector is tested on a regular basis. The detector must be checked at least once a week, after every maintenance stop and each time work is carried out in the area of the detector. Every malfunction in the detector must be rectified immediately and the machines or products protected by the detector must be stopped.

It is recommended that the metal detector be tested regularly with a certified test specimen and that the test results are recorded in a log book. As a rule, iron and stainless steel test specimens are supplied along with the detector.

A suitable test specimen and a test schedule should be specified for testing.

- The test specimen contains a metal sphere, which the respective detector safely recognizes. The test involves moving the test specimens through the detector along with the product and observing whether a metal alarm is triggered.
- The test schedule will specify when the detector is to be checked and by whom. Example: The QA representative must test the detector with the test specimen before every shift commences. The test result is then recorded in the Log Book along with the date, time and signature. Example: Test sphere recognized, 16 August 2007, 06.00 am, signed Müller.
- The entire system should undergo a visual inspection for damages.

Definition of the test conditions

The sensitivities indicated in the catalog or the Data Sheets were ascertained under the following framework conditions:

- The device has been in an activated state for at least 5 minutes.
- The ambient temperature is at 20°..25°C.
- There are no interfering influences due to electromagnetic fields (e.g. other motors, frequency converters, etc).
- There are no interfering influences due to magnetic vibrations (e.g. other motors, vibrating troughs, feeder belts, etc).
- The vibration filter in the control electronics is switched off.
- The sensitivity test is carried out with certified test specimens. Testing is performed with test specimens made of ferrous, non-ferrous (brass) and stainless steel 316.
- The smallest available test specimen sizes are ferrous 0.3 mm, non-ferrous 0.3 mm and stainless steel 0.5 mm. Furthermore, test specimens are not available in all intermediate sizes (increments of one tenth of a mm). Thus, specific sensitivity values can only be ascertained mathematically and are verifiable using the next larger, available test specimen size.
- The test specimens are always passed through the respective sensor for the sensitivity test at dead center (worst position).
- With drop sensors and extractors, the test speed is 3000 mm/s. The drop height for drop sensors is 0.6 m max. With belt detectors, the test speed is 300 mm/s. With inline sensors, testing is done at 500 mm/s.
- Ascertaining the sensitivities is performed without taking account of the product effect. In practice, if the product that is to be tested has self-conducting properties, the sensitivity values can deteriorate as a result of the electronics 'learning' the product effect. This means the values could increase.

Chapter F

The same thing can happen if external influences such as electromagnetic fields or mechanical vibrations (e.g. unavoidable with ejection elements) affect the metal detectors. These effects can fade out by 'learning' or changing the sensitivity. This can however also result in a deterioration of the sensitivity.

Maintenance

Depending on throughput volume and type of product (more or less abrasive materials), individual components can become worn. That is why a regular check for wear is absolutely necessary. The first such component to be inspected is the product pipe. It protects the ring detector. Initially, a weekly inspection is necessary. Later on, this period can be better assessed based on gained experience and can be modified later on, if necessary. If the product pipe shows signs of wear, it must be replaced. Otherwise, this could cause damages to the sensitive ring detector.

Similarly, the separation flap must be checked for wear. It is necessary to ensure the flap on the flap housing is leakproof. In metal separators with connection monitoring, the reset spring for the pneumatic cylinder must be examined for wear. The degree of wear on this subassembly depends on how frequently the separating unit switches, i.e. on the ultimate proportion of added metal.

The product tube, separating flap and reset spring are defined as consumables and are not covered by the warranty.

Check that the electrical terminal contacts are attached securely once a month. Similarly the electrical wiring and plugs are to be checked for crushed and damaged areas.

Additional Instructions

Information about residual risks. The detectable size of the metal parts is limited depending on the detector size and product characteristics. This means that, under certain circumstances, small, undetectable metal pieces may not be recognised and will remain in the product. Since this device is a metal detector, it is necessary to point out that other, non-metallic impurities will not be detected.

There is a residual risk associated with every moving or rotating system. This risk can be minimised by adopting appropriate occupational safety-related behaviour (e.g.: protective work clothing, safety gloves, hair net, regular instruction, ...).

Due to its function, there is a considerably greater electromagnetic field strength inside the metal detector tunnel than in the normal working area. Switch the detector off when working in this tunnel area.

After the system has come to the end of its working life it must be **disposed** of in accordance with the applicable legal regulations.

The owner/operator must notify the manufacturer about any damages to, malfunctions of and non-standard behaviour by the unit and about any accidents in association with the entire system.

Fault Clearance

Fault clearance on the control unit and in mechanical components

The control unit has an integrated self-diagnosis system. It allows the permanent monitoring of all the major functions of the control electronics.

Description of fault	Cause	Solution
Display remains dark after being switched on.	Device fuses are defective.	Open housing and replace fuse (Disconnect from mains!)
In the event of vibrations, the device sends an alarm.	Vibrations or reverberations bother the device.	Activate vibration filter and re-teach, if necessary.
Alarms occur in spite of vibration filter.	Altered ambient conditions can change the vibration signal.	Re-teach vibration filter
The device emits an alarm when test material moves through the sensor.	A signal is generated by the so-called product effect.	Learn and save product effect.
Alarm messages occur in spite of learned product effect.	Fluctuations in the product can also fluctuate the product effect.	Re-learn product effect or increase the sensitivity.
The discharge unit does not work.	Compressed air is not ok.	Check compressed air hose/connection.